Space Weather Forecast

Issued on Sunday, 18 August 2024 at 13:03 Local

This forecast provides a four-day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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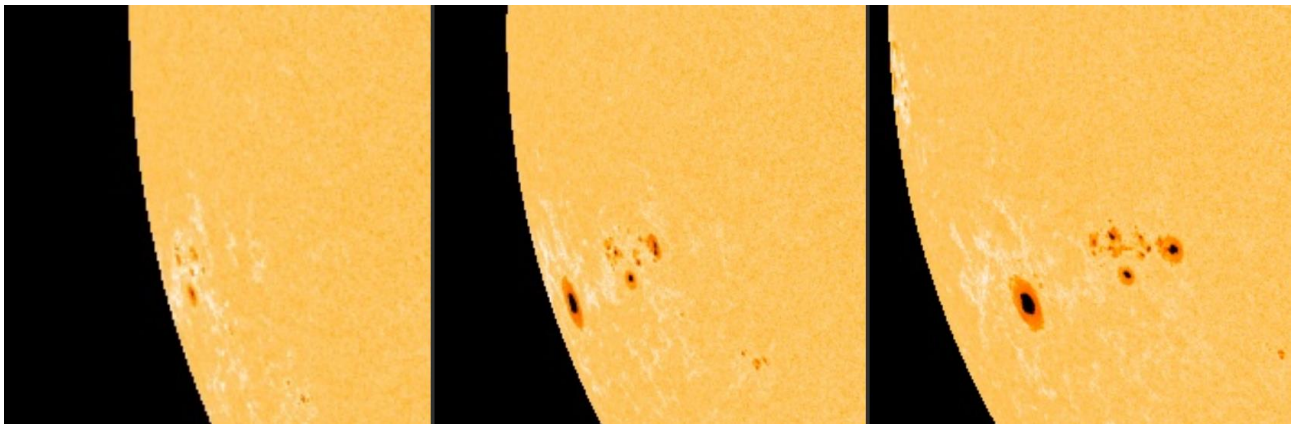
Space Weather Forecast Headline: Chance of G1 Minor geomagnetic storms now fading. Occasional Moderate-class flares expected, with a chance of X-class.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Activity was Moderate, with at least four low Moderate-class flares from well-separated sources in the northwest and southeast. The peak of these events was at 18/0204UTC from the northwest. The sunspot group responsible remains a large and complex region comprising one large spot, but now is seeing proliferation and spreading of minor northern spots, and it is the northeastern part of the group that has spawned recent activity.

There are now up to ten active regions on the facing side, with one having rotated off the western solar horizon. On the eastern horizon, a new magnetically bipolar region is now becoming visible - this appears potentially magnetically complex and may yet develop with further rotation. The main changes in the period were some intermediate sunspot development in a Moderate-class flare producing group in the southeast, such that group is now compact and has some complex magnetic polarity mixing (tending to favour larger flares). Finally, both of the recently identified northeastern regions saw slight growth, while one in the southwest saw the opposite tendency.

Figure 1: Visible light imagery sequence for 00UTC on 16, 17 and 18 August of the arriving southeastern sunspot region cluster. Foremost amongst these is the central dense cluster, which has Moderate-class X-ray flares to its name, however note the new region on the extreme upper left of the third frame which appears bright in extreme UV (not shown) and may be a further group to watch.



Narrowly before the current 24-hour period, extreme UV imagery suggested a possible Coronal Mass Ejection (CME) emanating from the upper corona around 17/1030UTC (outer layer of the Sun). This appeared to be sparked by activity within the main sunspot group, and was repeated at an even higher solar latitude (perhaps 60N) around 18/0500UTC. This earlier event is expected to pass narrowly north of Earth on day 4 (Wednesday 21 August), however a glancing influence

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cannot be completely ruled out. The second event is more comfortably heading above Earth to no effect.

Two final possible CMEs from the complex sunspot in the northwest around 18/0730UTC and 18/1030UTC are awaiting imagery for analysis, although these are provisionally quite far west for impacts. No Earth-directed CMEs are confirmed at the time of writing.

Solar Wind / Geomagnetic Activity: Solar winds showed an initial slow regime that was soon interrupted by the anticipated Strong-class X-ary flare-related CME arrival from 14 August. This feature arrived at near-Earth satellites (orbiting L1) at 17/1330UTC, with a 55-minute transit time to Earth to deliver a 40.0nT BGS Hartland H-component sudden impulse.

Solar winds rose from background levels to become slightly elevated in the UTC afternoon, later moderating somewhat. The number of particles in the solar wind underwent a stepwise increase as the associated magnetic field also rose from background to become elevated. The north-south component of this field was very erratic at first, however this became weakly co-aligned (with Earth's field) over time to eventually limit further geomagnetic activity. Other solar wind measures perhaps suggest some influence from the northern coronal hole fast wind in amongst the CME.

Geomagnetic activity was quiet at first, but rose to G1 Minor to G2 Moderate storm 17/1500-2359UTC. The interval 17/1500-1800UTC was reported as a provisional G3 Strong storm (Kp 7-), but has subsequently been downgraded to a G2 (Moderate, Kp 6+), with quiet to unsettled activity then rounding out the 24 hours.

Energetic Particles / Solar Radiation: No solar radiation storms were observed, despite the sustained cadence of potentially generative Moderate-class X-ray flares.

Four-Day Space Weather Forecast Summary

Solar Activity: Moderate to high activity is expected with further occasional Moderate-class flares, and a chance of isolated Strong-class flares perhaps now bolstered by a new eastern solar horizon arrival. These risks reduce slightly midweek UTC as the most active region of late progressively crosses onto the far-side.

Solar Wind /Geomagnetic Activity: There are now no Earth-directed CMEs, however the broad coronal reconfiguration CME from the north of the Sun on 17 August has a small chance of giving a close pass on day 4 (Wednesday 21 August). Otherwise, ongoing 14 August CME effects - perhaps enhanced by some interaction from any fast wind, are possible early on day 1 (18 August) before easing later in the UTC day.

Solar winds should then ease to background day 2 (19 August) onward. Mainly quiet conditions are expected, however there is a slight chance of G1 Minor Storms from any ongoing CME influence early on day 1 (18 Aug).

Energetic Particles / Solar Radiation: No solar radiation storms are expected, with a Slight Chance of breaching S1 Minor solar radiation storm level should any notable flares occur.

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Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	Yes	20	1	1	5
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	Yes	80	80	80	70
Very Active	R3 to R5 X	No	25	25	25	15

Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	No	20	20	20	20
Very Active	≥ S3 *	No	5	5	5	5
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

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